ASTR/PHYS PROFESSIONAL DEVELOPMENT

FREE PIZZA!

Join faculty and graduate students from APS and Physics for a discussion on

Grad School:

Should I go?
Where should I go?
How do I apply?
How do I get in?

4:45-6:00
Tuesday,
15 October
Duane G130

Alysia Marino, PHYS faculty
amarino@colorado.edu

Willa Arthur-Dworschack, PHYS grad student
Willa.Arthur-Dworschack@colorado.edu

Kevin France, APS faculty & Grad Assoc. Chair
kevin.france@lasp.colorado.edu

Natalia Porraz, APS grad student
natalia.porraz@colorado.edu

Michael Rothman, APS grad student
Michael.Rothman-1@colorado.edu

Slides posted on APS and PHYS websites
Recording available here
https://cu-classcapture.colorado.edu/Mediasite/Channel/ed48e1ff92334c73bbc433354716ec555f/browse/null/most-recent/null/0/null

Contact us with questions:
amarino@colorado.edu
kevin.france@lasp.colorado.edu

2025-2026 Events – APS/PHYS Professional Development

Fall ’25 planned events:

- 20 Oct: Grad School
- 5 Nov: Getting involved in UG research (PHYS emphasis)
- 11 Nov: Getting involved in UG research (ASTR emphasis)

Spring ’26 events under consideration

- Careers in Education and Outreach
- Careers in Industry
- Applying for Jobs
- Your requests here!

Grad School Discussion - Agenda

[5 m] Welcome & Overview: John Keller
[10 m] Grad School in Physics: Alysia Marino
[5 m] Perspectives from a Physics grad student: Willa Arthur-Dworschack
[5 m] Q&A
[10 m] Grad School in Astrophysics & Planetary Science: Kevin France
[10 m] Perspectives from an Astro/Planetary grad student:
Natalia Porraz + Michael Rothman
[5 m] Closing comments: Kevin France & Alysia Marino
[10 m] Q&A

6:00pm Adjourn

Who’s here tonight…

- Physics Majors?
  - Engineering Physics?
- Astrophysical & Planetary Sciences?
  - Physics Emphasis
  - Interdisciplinary Emphasis
- Other?
- How did you hear about this event?
- Graduating this year?
- Next year?
- Later?
- Any grad students?

- Wants to do research as a career?
- Join a research group?
- Lead a research group?

Interested in these career paths??

- Observatory staff (e.g., Apache Point, HST, JWST)
- Mission outreach, communication (LASP, JPL)
- Planetarium & Museum staff (anywhere), animation (e.g., Fiske; Disney)
- Mission systems engineer (e.g., Ball, Lockheed Martin)
- Satellite operations, Earth remote sensing (e.g., LASP, SwRI, Digital Globe)
- Science data analyst, scientific visualization
- Mission proposal development (e.g., Ball, Lockheed Martin)
- Mission hardware development & test, operations

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→ No PhD required!

Professional Development

This website is designed to offer resources and advice that will help you succeed in your career after graduating CU Boulder. Navigate with the following main sections:

About

APS/PHYS Professional Development is a resource for undergrads in fields related to physics and astronomy at CU Boulder. This website includes resources and information designed to help undergraduates in APS/Physics develop successful longterm careers.

Previous Events/Resources

Recordings and presentations of past events. Check out this page if you want to see the presentation from an event you missed!

Undergraduate Opportunities

Opportunities to build your career while you are pursuing your undergraduate degree at CU, including research, teaching, and campus programs.

Applying to Grad School

Resources for choosing graduate programs, writing entrance essays, taking standardized tests, conducting interviews and visits, and finding funding through fellowships/scholarships.

Careers

Advice and resources for using your APS/Physics degree to find a career.

Background

APS/PHYS Professional Development (previously "Beyond Boulder") was started in Fall 2008 by Makenzie Lystrup with support from a National Science Foundation Astronomy & Astrophysics Postdoctoral Research Fellowship. She ran the program through Spring 2011. Emily Levesque led the program from 2011-2014, and Mikki Osterloo of CU/LASP from 2014-2016, and Nick Schneider of APS from 2016-2020. Meredith MacGregor has been the coordinator since Fall 2020.

Applying to Grad School

Should I apply to graduate school?

Earning a graduate degree can open up many opportunities that would not be available with just a bachelor's degree, especially if you would like to pursue a career in research. That being said, depending on your career goals, it may make the most financial sense not to attend graduate school. A Master's degree can be expensive, and while PhD's are funded, they entail years of work at a barebones salary, which presents a severe financial opportunity cost. PhD's in particular also require a 5-6 year time commitment that typically includes taking additional courses, working on one research project for years, and writing/defending a thesis about your research.

When making this decision, you should consider your career goals and financial goals. It can be helpful to look up some of your dream positions, and see what the education/experience requirements are. For example, if your dream job is to be a Senior Project Engineer at Boeing on the Laser and Electro-Optical Systems team, you will need 10+ years of engineering experience and 5+ years of leadership experience- but only a Bachelor's degree. In that listing, even the "preferred qualifications" section included laser-optics experience and security clearance- but no graduate degree.

When deciding whether to pursue graduate school, you should consider personal factors (like whether you enjoy research and your reasons for considering graduate school) in addition to financial and career goals. Dr. Ijeoma Kola has written two helpful blog posts: 6 Bad Reasons to Get a PhD and 3 Good Reasons to Get a PhD (note that her point about teaching does not apply to APS/Physics, but the rest of the advice applies). Reading through these blog posts and other first-hand accounts from people with graduate degrees may help you get a sense of whether you will enjoy graduate school.

Many students who want to ultimately earn a graduate degree choose to join the workforce for 1-3 years to gain experience and perspective before applying to grad school. Check out GoGrad's blog post for some pros/cons of this option.

Applying to Grad School

In this section of the website, we have resources and advice about various steps in the graduate school application process:

Finding Programs

How to choose what type of graduate program to apply to and how to pick specific graduate programs to apply to.

Entrance Exams

Information and study tips for the entrance examinations (Physics GRE and General GRE), and what tests you need to take for APS/Physics programs.

Essays

Advice and resources for writing Personal Statements and Statements of Purpose.

Curriculum Vitae

Resources and ideas for things to add to your Curriculum Vitae (CV).

Interviews and Visits

Questions to ask and ways to prepare for in person graduate school visits and interviews.

Funding

Fellowship/Scholarship sources and information about their deadlines, requirements, etc.

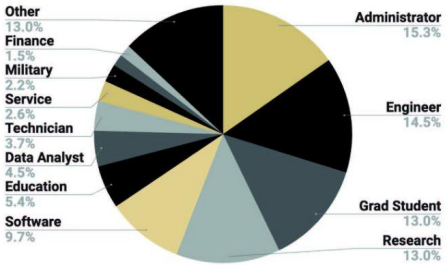
Advice for APS students

Mike Shull, former APS Professor & Graduate Admissions Chair, prepared some answers to the question of what types of

https://www.colorado.edu/aps/undergraduate-studies/professional-development

Where APS Can Take You

Job Categories for APS Alums

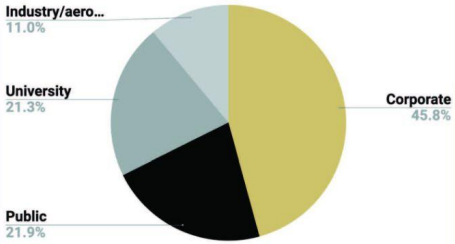


Biggest Employers of APS Alums

(in descending order)

University of Colorado Boulder, University of California Berkeley, other universities, LASP, Los Alamos National Laboratory, Other public research labs, BAE Systems, NASA, Lockheed Martin, Blue Canyon Technologies, other aerospace corporations, US Military, K-12 education

Sectors Employing APS Alums



Most Common Career Paths:

- Research & Academia (24%)
- Aerospace & Engineering (15%)
- Administration (15%)
- Software & Data Science (10%)
- Education (5% in K–12, outreach)

Major Emphasis Outcomes:

- Physics Emphasis grads often pursue PhDs, seek research and technical careers
- Interdisciplinary Emphasis grads pursue broader roles across STEM, education, and business
- Both emphases lead to success in the sciences, STEM, and beyond

To find your path:

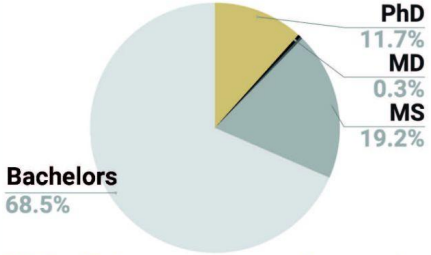
- *Talk to your faculty mentor*
- *Attend career events*
- *Seek out-of-classroom opportunities*
- *Use Professional Development resources on the APS website https://tinyurl.com/APS-ProfDev*

For the full report on undergraduate outcomes see https://tinyurl.com/APS-outcomes

For more information on the program:

- https://www.colorado.edu/aps/
- 303-492-8915
- aps-office@colorado.edu

Highest Degree Earned



31% of alums pursue advanced degrees.

Master's degrees (19%) span many fields. Within this group, the most common programs are:

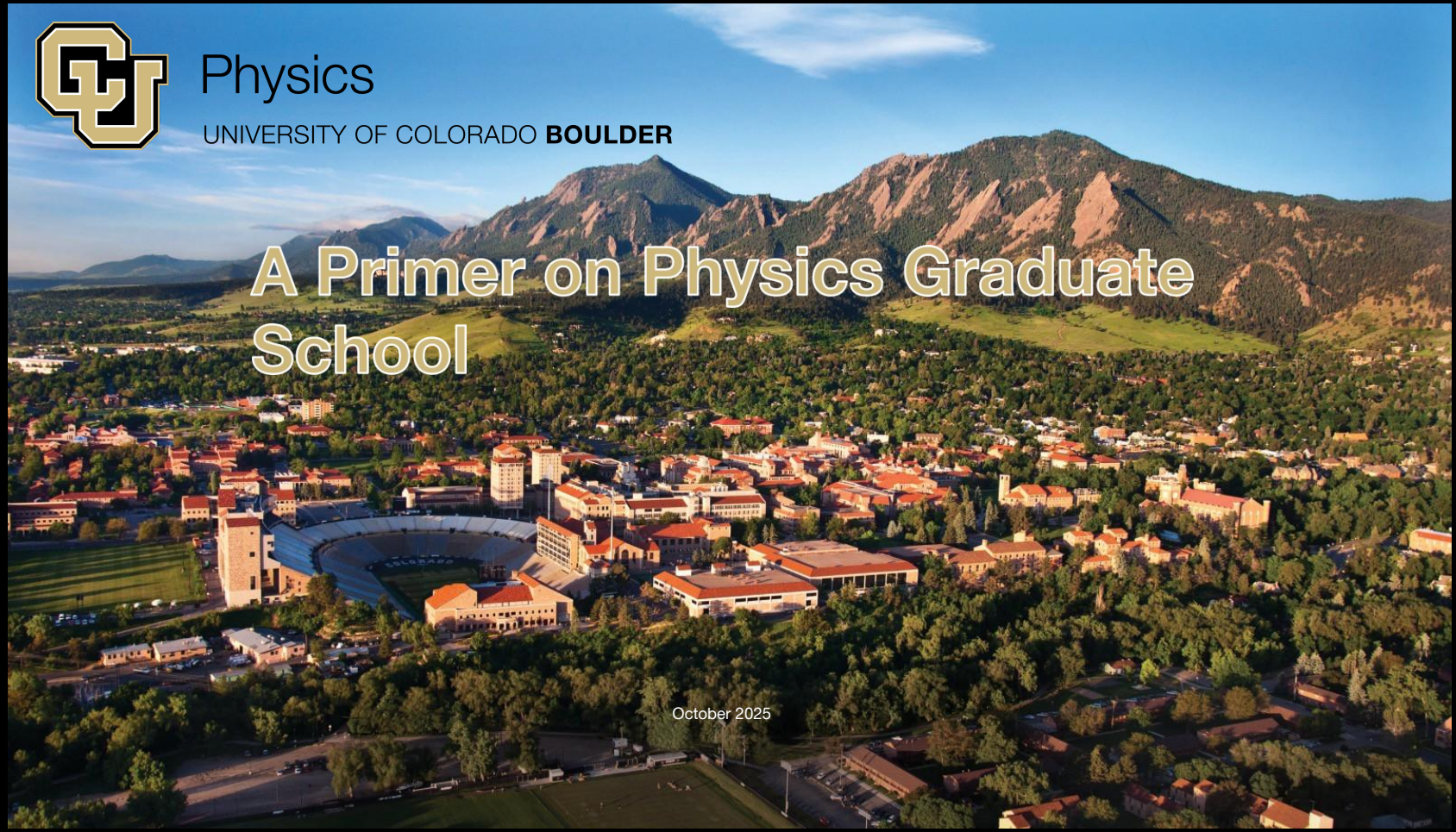
- **Engineering** (6%) – including aerospace, mechanical, and systems engineering
- **Education** (2%) – for careers in teaching or science outreach
- **Astronomy & Physics** (2% each) – for research or teaching roles
- Many graduates take gap years before entering grad school, or earn a degree after starting their careers

PhD programs (12%) are important for students focused on leading research, with a large majority specializing in physics, astronomy, or engineering.

Note: Data represent APS alums from 2001 (when the major was created) to Spring 2024. Of these 790 alums, 76% have employment data represented.

JK’s Closing Comments

- Think through whether your goals really require a PhD and if this is how you wish to spend the next 5+ years of your life.
  - Remember that applying after an interval of being in the “real world” is an option.
- Apply to many schools (10-12?) including a bunch that are less competitive
  - If you don’t get into your top choices, would you rather not go to grad school?
  - The best “safety school” is a smaller program with 1-2 researchers you’ve contacted
- Identify your recommendation letters writers early and establish relationships
  - Show them through your actions that you’re ready for grad school; seek their advice
  - Given them a concise list of schools with deadlines easy, a month in advance if possible
- Your personal statement should emphasize skills, projects, verbs, readiness
- If you’re applying next year, do everything possible to get research experience
  - Come to our next event on Tuesday 11 November to hear many internship offers


Physics
UNIVERSITY OF COLORADO BOULDER
A Primer on Physics Graduate School
October 2025

A Disclaimer

- These are my personal opinions on the topic. You should not take what I'm saying as the "truth". You should talk to other professors, postdocs, graduate students, etc.

- Based on my experience at CU and other institutions where I have spent time. Not all of this applies to all programs. International programs might be quite different.

Is Physics Graduate School Right for You?

- Are you truly passionate about physics, especially physics research?
- Are you getting very good grades in your physics and math courses?
- Are you interested in becoming a professor, doing original research, and/or leading a research team?
- Are you happy to work long hours on physics?
- Are you willing to take another 2-3 years of difficult classes?
- Are you OK with not being paid a high salary for the next 10 years?
- If you answered yes to all of these questions, then physics graduate school may be for you.

What is physics graduate school like?

- Many programs in the US (but not Canada) do not have a standalone Master's degree
- Typically admitted to a Ph.D. program, which can take 6-7 years
- You take classes for 2 years and earn a Master's along the way
- By the end of first year, should be doing research along with classes
- You may be supported as a teaching assistant (especially year 1). You need to spend 20 hrs per week teaching in addition to coursework.
- Typically by year 2 or 3 you will be supported by your research advisor/group as a research assistant, doing 40+ hours a week of dissertation research once you are done with classes.
- Grad school stipends for TAs and RAs are around $35k-40k per year. But your TA or RA position will cover your tuition. (Not necessarily true in engineering or other fields.)

Learning physics is not the same a doing physics research

- You will take some courses in graduate school, but will spend the majority of your time doing research.
  - You will have to spend long hours debugging things and figuring out how to make things work.
  - You are trying to do things that people haven't done before, so it isn't just turning a crank.
  - You will need to work successfully with teams, but also need to be able to work independently on your project.
  - There will be a lot of writing and public speaking.
- Be sure that you like research and not just learning about the work that others have done.

What Graduate School is Best for You?

- To start your school evaluations, can look at GradSchoolShopper: https://gradschoolshopper.com
- Things like US News can tell you about the department overall, but not as useful for specific research topics.
- Talk to faculty working in that area for suggestions.
- Your future success depends much more on you and your research than the overall department reputation. If you have a good idea of what physics you want to do, you should make sure the university is doing solid, interesting research in that area.
- Even if a school has the ideal advisor/group be aware that not all groups are hiring all the time. So having multiple options is good.
- Summary: do not chase rankings; look for a good fit.

How Applications are Evaluated - Academics

- **Academics**
  - Good grades are important. If there are extenuating circumstances that lowered your GPA, these should be addressed in the personal statement.
  - You should take the general GRE exam (taken by computer at home, but look at some practice exams first).
  - Some schools require a Physics Subject GRE exam (offered only twice in fall and once in spring). You NEED to study for it.

How Applications are Evaluated - Research

- **Research Experience and Apptitude**
  - Most schools require a personal/research statement.
    - Successful applicants have a year or more of undergrad research experience. An honors thesis is a nice bonus.
    - Describe past research, emphasizing your contributions, and show that you took initiative and were involved intellectually.
    - Your plans for future research should be well thought out. Describe what you want to do and why this school is a good fit for your goals.
  - Most schools require 3 or more recommendation letters.
    - The best letters are from professors (preferably physics) who supervised your research (or know you well from lab courses, etc.).
    - The less useful letters are from professors who only know you from a lecture course. If you had good physics discussions with them during office hours, that can be helpful.
    - The least useful letters are from coaches or supervisors at non-physics jobs as they don't really know what is required for a physics Ph.D.

Words of Advice

- **Things to do now**:
  - Do lots of physics research (school year and summer).
  - Take full breadth of physics courses and get good grades.
  - Talk to professors. If they get to know you, they can write good letters.
- **Things to do when applying**:
  - Get advice from multiple sources (professors, postdocs, grad students).
  - Actions speak louder than words in the statements. Focus on what you have done/accomplished instead of flowery language. Be factual.
  - Have multiple people review your CV and research statement(s).
  - Provide letter writers with information about you (research, awards, etc.).
  - Apply to a variety of programs so that you have choices.
  - Indicate areas of physics you are interested in, but don't be too narrow. Listing professors whose research you find interesting is good.

FAQs

- Should I visit schools now?
  - *No. Usually schools will pay for you to visit after you are admitted. Perhaps could have a future session in early Spring about what to do when visiting?*
- Should I email faculty at the schools I am interested in?
  - *Maybe. Likely won't improve admissions chances but you might be able to determine if they are likely to be looking for new students next year.*
- How many places should I apply to?
  - *Around 10 is reasonable. Less than 5 or more than 20 doesn't seem advisable.*
- Can I change my research plan?
  - *Usually. For most institutions, you are admitted to the department and need to find a research group. For some institutions, you are expected to work in a particular group.*
- Are there fee waivers?
  - *In many cases there are admission fee waivers available, though deadlines might be earlier. See school websites.*

Grad School in the Astrophysical & Planetary Sciences

ASTR/PHYS Professional Development – Fall 2025

John Keller & Kevin France (APS faculty)

Topics:

- What should I expect in astro/planetary grad school?
- How can I get into grad school?

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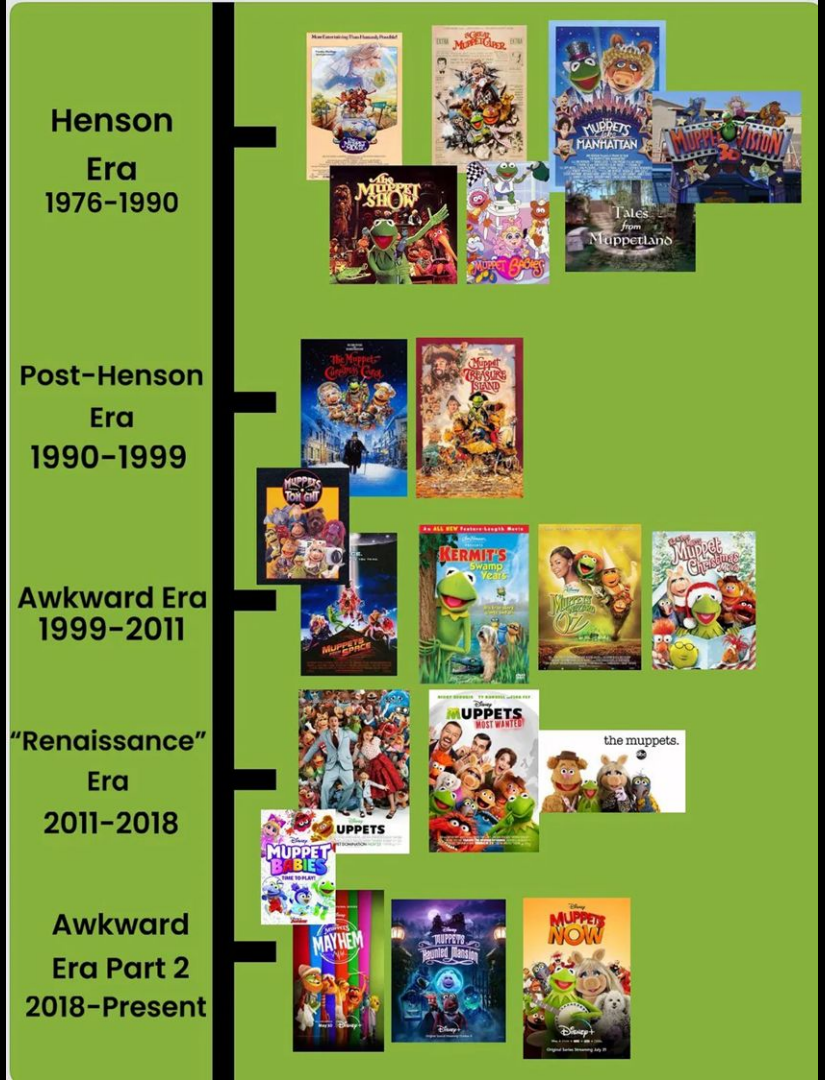

Topics:

- What should I expect in astro/planetary grad school?

Settling in Era
(welcome to APS, TA/RA training, first year mentor meeting, initial courses)
Years 0 – 0.5

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Postdoc in Training Era
(build on comps or pivot to final thesis topic, do research)
Years 3.5 – 6

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Postdoc in Training Era
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Years 3.5 – 6

Defense Era
(write, apply for jobs, defend)
Years 6 - 7

What can I expect in astro/planetary grad school?

- APS offers PhD admission only (no “terminal” masters)
- Coursework: first 3 semesters mostly occupied with coursework and “learning the ropes”
- Finding a research mentor: during or before first year; requires initiative! (Nobody goes without a research mentor/project)
- Comprehensive exam:
  - Fall of third year
  - Research presentation and paper on short project relevant to subfield
  - Usually, but not necessarily related to eventual thesis
- Thesis research:
  - 2-3 years “post-comps”
  - Become the world expert in chosen subfield and topic of research
  - Learn to become an independent scientist and publish

How do grad programs in APS research areas differ?

- Astrophysics programs are most similar to physics programs, expecting similar preparation. Some programs are within PHYS depts.
  - https://gradschoolshopper.com from API
  - https://aas.org/learn/college-departments-offering-astronomy-related-degrees

- Planetary programs are all different, occasionally “stand-alone” but often joint with astrophysics, earth science or atmospheric science. Sometimes not a “program”
  - https://dps.aas.org/education/graduate-schools for planetary programs
  - open positions at https://docs.google.com/spreadsheets/d/12yRS2c9-eW4DGLcb3cPgZU759gll_QZjnDk-ptlh3k4/

- Solar & space physics programs are rare but worth checking out
  - https://docs.google.com/spreadsheets/d/19cTA9vtAokPT9gIQdnyT3PsVdCdjeT-Xeuj696TAthA

→“Terminal Masters” degrees in these fields are very rare and very expensive

How can I get into grad school?

- Application process starts in the late summer/early fall
  - Need to identify letter writers (faculty/research mentors) ASAP in fall
  - Start drafting the "personal statement" during the summer/early fall, give time to faculty mentors to read it and provide feedback
- Typical application deadline is around December 1 each year
- Acceptance rates range from ~1% to 25% depending on program and subfield (APS in AY24-25: > 500 applicants, ~25 acceptances, ~10 matriculations)
- Admissions process is done very differently depending on the program/department

How can I get into grad school?

- Qualities sought in applicants/admits are those that signify likelihood of success in the PhD program:
  - Fundamental knowledge (and success in) physics, math, and related coursework
  - Ability to perform (independent) research
  - Creativity
  - Perseverance
  - Professionalism

- READ THE PROMPT
- Tailor response to prompt and department

How can I get into grad school?

- Fundamental knowledge (and success in) physics, math, and related coursework
  - Generally A's an B's in these subjects (a 'C' is not a deal-breaker, though)
  - Upward trend looks good
  - Explain any particularly poor performance in the personal statement as appropriate

How can I get into grad school?

- Ability to perform (independent) research
  - Summer REU or similar
  - Part-time research during academic year w/ faculty mentor
  - Honors thesis
  - Class project!
  - Intensive technically oriented hobbies

How can I get into grad school?

- Creativity & Perseverance
  - Personal statement should tell a story about these as appropriate

- Professionalism
  - Letters of recommendation should vouch for you
  - Personal statement should show clear commitment and understanding of what a PhD means for short- and long-term career plans/aspirations

What if I decide grad school isn’t for me?

(And that’s Ok!)

Thank you for coming!! We would love to hear about your experience and how to make it better!